Trend Study 16C-17-04

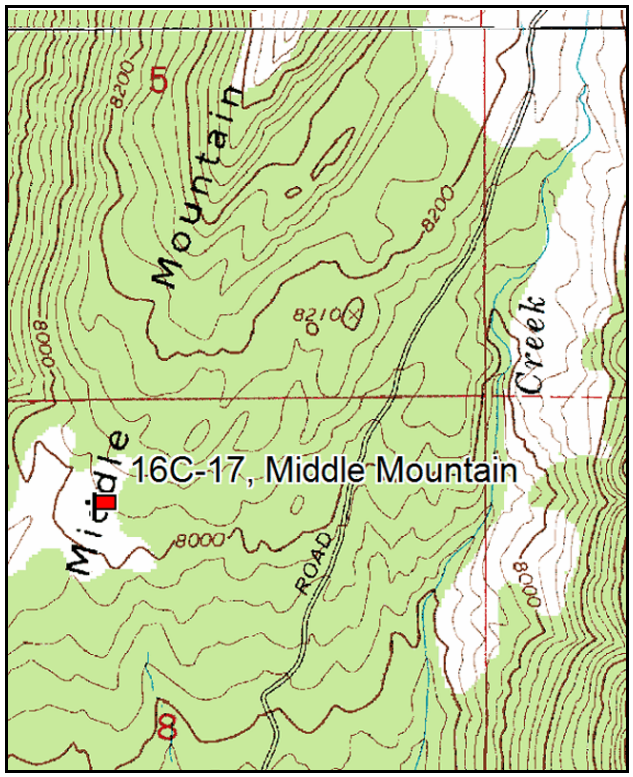
Study site name: Middle Mountain . Vegetation type: Chained, Seeded P-J .

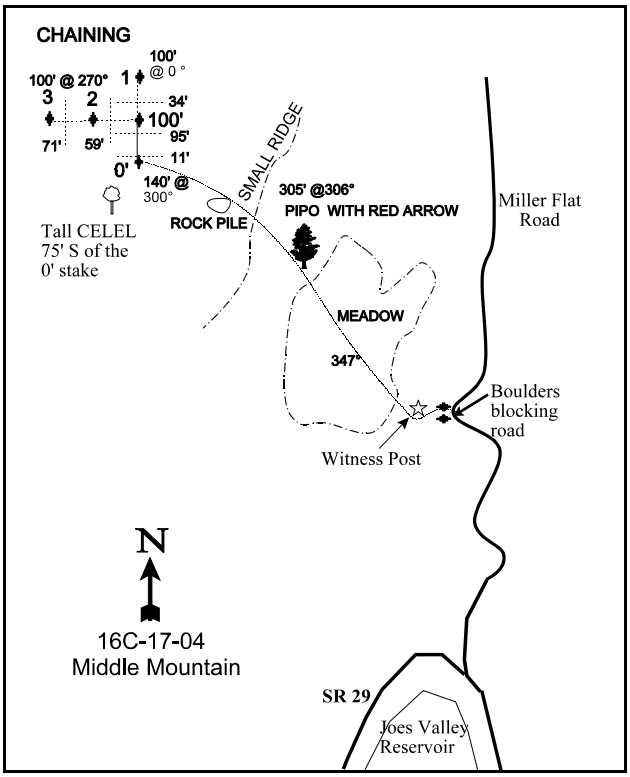
Compass bearing: frequency baseline 345 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From the paved highway at the north end of Joes Valley Reservoir, proceed north on the Upper Joes Valley road (Millers Flat road) for 1.2 miles. Stay right at the fork and continue l.2 miles to another fork. Stay right (on the Indian Creek side) and go 1.1 miles to a faint turnoff to the left. Park by the witness post which is about 75 yards off the main road. From the witness post, walk NNW to the upper end of the meadow to the lighting-scarred Ponderosa with a red arrow painted on it. From the pine tree walk NW 100 yards to a pile of rocks painted red. From the rock pile, walk NW (300/) for 140 feet to the 0-foot baseline stake. The 1st stake has a red browse tag #9018 attached.





Map Name: Joes Valley Reservoir Diagrammatic Sketch

Township 17S , Range 6E , Section 8 GPS: NAD 27, UTM 12S 4357009 N, 476952 E

DISCUSSION

Middle Mountain - Trend Study No. 16C-17

The Middle Mountain site is a diverse, productive area of high elevation range used by both deer and elk as winter-spring range. The study is located at the upper end of a small (approximately 200 acre) chaining on a slope where the pinyon and juniper trees were never very dense. It is more of a mixed mountain brush site. The gradual, southwest-facing slope allows for use during most winters. The slope is open, but nearby stands of Ponderosa pine, aspen, and mature curlleaf mountain mahogany on the ridge provide excellent cover and additional foraging opportunities. The elevation is 8,100 feet. The lower end of the chaining is dominated by grass, where there is less sign of big game use. Pellet group data from 1999 estimated 26 deer and 35 elk days use/acre (64 ddu/ha and 87 edu/ha). Sheep sign was also encountered and some animals could be heard in the area. One moose pellet group was also encountered on the site in 1999. Pellet group data from 2004 was very similar with 39 elk and 16 deer days use/acre estimated (96 edu/ha and 40 ddu/ha).

There are some sandstone rocks on the surface, but overall the soil is moderately deep and free of rocks. Effective rooting depth is estimated at just over 15 inches. Depth measurements were limited by a compacted soil horizon. The soil has a clay to sandy clay loam texture and a neutral pH (7.2). Phosphorus is very limited at just 2 ppm, the lowest reading of any site in 16C. Values less than 10 ppm can limit normal plant growth and development. There is little rock or pavement on the surface. Some localized soil movement is occurring on the site, including some small rills about 10 to 20 feet in length in places and soil pedestalling is evident around plants, although there are no gullies. A network of game trails that lack cover show signs of some active erosion. An erosion condition class was determined to be stable in 2004.

The site supports a variety of desirable browse species including, mountain big sagebrush, black sagebrush, Utah serviceberry, and true mountain mahogany. Mountain big sagebrush and black sagebrush display moderate to heavy use, good vigor, and low percent decadence. The population of black sagebrush has increased steadily from 599 plants/acre in 1988 to 3,000 in 2004. Mountain big sagebrush has remained relatively stable at about 2,000 plants/acre. Black sagebrush and mountain big sagebrush combine to provide nearly one-half of the total browse cover. Other key preferred browse species are true mountain mahogany and Utah serviceberry. The true mountain mahogany population was estimated at 580 plants/acre in 2004, which accounted for 17% of the total browse cover. Mature plants average about 2 feet in height, show moderate to heavy use, and are in good vigor. Leader growth was excellent in 1999 at about 9 inches, but some of the new leaves were withered due to insect damage.

Serviceberry is less abundant with an estimated density of 440 plants/acre in 1994, 620 in 1999, and 380 in 2004. Mature serviceberry are small averaging only 14 inches in height in 2004. These shrubs were extremely heavily browsed in 1988 but have displayed more moderate to heavy use since.

Some fair forage is provided by the numerous but small dwarf rabbitbrush whose population density was estimated at nearly 6,000 plants/acre in 2004. These shrubs provided 18% of the browse cover in 1994 and 20% in 2004. Additional forage is provided by small populations of curlleaf mahogany, antelope bitterbrush, and snowberry. Pinyon and juniper trees can be found scattered throughout the site in small numbers. Point center-quarter data from 1999 estimated 24 juniper and 20 pinyon trees/acre with average diameters of 3.1 and 1.6 inches respectively. A few white pine trees were also encountered.

The herbaceous understory is diverse and abundant. Salina wildrye is the dominant grasses. It provides about 80% of the grass cover. The only other common grass is prairie June grass. Forbs are also diverse and abundant. Common species include pussy toes, aster, bastard toadflax, Eaton fleabane, thistle, and desert phlox.

1994 TREND ASSESSMENT

Ground cover characteristics have changed considerably since 1988. Percent bare ground has more than tripled and litter cover has declined by 73%. Nested frequency of herbaceous vegetation has declined slightly, but it is still abundant. Trend for soil is down. The browse trend is currently stable. The key species display stable population densities, reduced heavy utilization and good vigor. The herbaceous understory trend is stable. Sum of nested frequency for grasses has increased slightly, while those of forbs has declined slightly. This decline is due to drought conditions during the spring of 1994 in which precipitation was only 60% of normal. The Desirable Components Index (see methods) rated this site as good with a score of 68 due to low decadence, fair shrub cover, and good perennial grass and forb cover.

TREND ASSESSMENT
soil - down (1)
browse - stable (3)
herbaceous understory - stable (3)
winter range condition (DC Index) - 68 (good) Mountain big sagebrush type

1999 TREND ASSESSMENT

Trend for soil is up slightly due to a decline in percent bare ground from 44% to 39% and an increase in litter cover from 20% to 27%. Vegetative cover also increased from 30% to 39%. Trend for browse is up for serviceberry, black sagebrush, and true mountain mahogany. Densities of these key species have increased, vigor has improved, and percent decadence is lower. Heavy use is also lower on serviceberry and mahogany. Mountain big sagebrush is another key species which provides 23% of the shrub cover. Density has declined slightly since 1994, but vigor has improved and percent decadence has declined from 33% to 16%. Overall trend for browse is considered up slightly. Trend for the herbaceous understory is stable. Sum of nested frequency of perennial grasses has increased slightly, but the frequency of the dominant species, Salina wildrye, is stable. The sum of nested frequency of perennial forbs has declined slightly, although cover of forbs has increased nearly three fold. However, 73% of the forb cover comes from pussy toes, thistle, and bastard toadflax. The Desirable Components Index rated this site as excellent with a score of 87 due to low decadence, increase in shrub cover, and good perennial grass and forb cover.

TREND ASSESSMENT
soil - up slightly (4)
browse - up slightly (4)
herbaceous understory - stable (3)
winter range condition (DC Index) - 87 (excellent) Mountain big sagebrush type

2004 TREND ASSESSMENT

Trend for soil is stable. Relative percent cover of bare ground, litter, and vegetation are similar to 1999 estimates and herbaceous cover is stable. There is some localized erosion occurring but it is minimal. Trend for the key browse species, black sagebrush, mountain big sagebrush, and true mountain mahogany, is up slightly. Density of black sagebrush has increased slightly, use remains light to moderate, vigor good, and decadence low. Seedlings are abundant and young recruitment is good. Mountain big sagebrush rose 28% in density to 2,140 plants/acre. Utilization remains moderate to heavy, vigor good, and decadence low at 16%. Seedlings were very abundant in 2004 and young plants accounted for 23% of the population. True mountain mahogany is stable. Density has declined slightly, utilization is extremely heavy, but vigor remains normal and there are no decadent plants. Overall shrub cover has steadily increased from about 12% in 1994 to 27% in 2004. Many of the sagebrush seedlings were very small when the site was read on July 22 and may not survive the dry summer. Trend for the herbaceous understory is down slightly. Sum of nested frequency for

perennial grasses is down slightly with a significant decline in the frequency of Prairie June grass. The dominant grass, Salina wildrye, remained stable. Sum of nested frequency for perennial forbs declined 30% and average cover dropped by nearly two-fold. The forb composition is diverse but many of the more abundant forbs are less desirable species, Aster, thistle, bastard toadflax, and owl clover. The Desirable Components Index rated this site as excellent with a score of 90 due to low decadence, increase in shrub cover, and good perennial grass and forb cover.

TREND ASSESSMENT
soil - stable (3)
browse - up slightly (4)
herbaceous understory - down slightly (2)
winter range condition (DC Index) - 90 (excellent) Mountain big sagebrush type

HERBACEOUS TRENDS --
Management unit 16C, Study no: 17

Type	Species	Nested Frequency				Average Cover %		
		'88	'94	'99	'04	'94	'99	'04
G	Agropyron spicatum	44	50	33	39	1.40	.54	.79
G	Carex spp.	9	-	-	-	-	-	-
G	Elymus salina	244	258	264	237	11.48	11.38	11.82
G	Koeleria cristata	$_{ab}$52	$_{a}$27	$_{c}$110	$_{b}$77	.26	2.42	1.95
G	Poa fendleriana	$_{b}$56	$_{c}$76	$_{a}$24	$_{a}$10	.86	.26	.10
G	Poa secunda	$_{a}$-	$_{ab}$12	$_{b}$22	$_{a}$7	.24	.14	.18
G	Sitanion hystrix	-	-	2	-	-	.03	-
G	Stipa lettermani	-	7	-	5	.21	-	.06
Total for Annual Grasses		0	0	0	0	0	0	0
Total for Perennial Grasses		405	430	455	375	14.47	14.80	14.92
Total for Grasses		405	430	455	375	14.47	14.80	14.92
F	Allium spp.	$_{b}$54	$_{a}$-	$_{a}$-	$_{a}$-	-	-	-
F	Antennaria rosea	$_{a}$18	$_{a}$28	$_{b}$92	$_{a}$17	.35	1.83	.33
F	Androsace septentrionalis (a)	-	$_{a}$-	$_{b}$13	$_{a}$6	-	.13	.04
F	Arabis spp.	-	3	-	-	.00	-	-
F	Astragalus convallarius	-	2	-	1	.00	-	.00
F	Aster spp.	$_{a}$54	$_{b}$102	$_{a}$38	$_{b}$83	.56	.28	.92
F	Astragalus spp.	2	5	7	-	.02	.19	-
F	Castilleja linariaefolia	5	-	4	-	-	.01	-
F	Calochortus nuttallii	-	-	3	1	-	.00	.00
F	Chaenactis douglasii	-	-	-	1	-	-	.00
F	Cirsium spp.	$_{b}$105	$_{b}$94	$_{b}$98	$_{a}$53	.68	4.07	1.85
F	Comandra pallida	$_{b}$60	$_{a}$35	$_{c}$108	$_{bc}$70	.13	2.89	1.23
F	Collinsia parviflora (a)	-	-	-	3	-	-	.00

Type	Species	Nested Frequency				Average Cover %		
		'88	'94	'99	'04	'94	'99	'04
F	Crepis acuminata	5	1	-	-	.00	-	-
F	Cryptantha spp.	2	4	-	-	.01	-	-
F	Cymopterus spp.	-	5	-	1	.01	-	.00
F	Erigeron eatonii	$_{c}$159	$_{b}$79	$_{b}$54	$_{a}$3	.42	.30	.09
F	Erigeron flagellaris	-	-	-	4	-	-	.03
F	Eriogonum umbellatum	2	7	-	-	.03	-	-
F	Gayophytum ramosissimum(a)	-	-	-	2	-	-	.00
F	Hymenopappus filifolius	$_{a}$6	$_{ab}$20	$_{b}$24	$_{ab}$17	.30	.52	.38
F	Lesquerella spp.	-	-	2	-	-	.03	-
F	Lomatium grayi	$_{b}$38	$_{a}$2	$_{a}$-	$_{a}$-	.00	-	-
F	Machaeranthera canescens	-	-	-	4	-	-	.04
F	Microsteris gracilis (a)	-	-	-	1	-	-	.00
F	Orthocarpus spp. (a)	-	$_{a}$-	$_{b}$21	$_{c}$136	-	.18	4.03
F	Penstemon caespitosus	$_{c}$76	$_{c}$66	$_{a}$-	$_{b}$25	.66	-	.46
F	Penstemon lentus	4	-	-	5	-	-	.09
F	Phlox austromontana	14	34	28	35	.77	.82	.99
F	Phlox longifolia	-	-	-	1	-	-	.00
F	Polygonum douglasii (a)	-	$_{a}$3	$_{a}$-	$_{b}$36	.00	-	.10
F	Senecio multilobatus	3	-	-	-	-	-	-
F	Sphaeralcea coccinea	10	24	20	13	.10	.11	.11
F	Taraxacum officinale	$_{b}$8	$_{a}$-	$_{a}$-	$_{a}$-	-	.03	-
Total for Annual Forbs		0	3	34	184	0.00	0.31	4.19
Total for Perennial Forbs		625	511	478	334	4.08	11.12	6.57
Total for Forbs		625	514	512	518	4.09	11.43	10.77

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --
Management unit 16C, Study no: 17

Type	Species	Percent Cover			Average Cover %		
		'94	'99	'04	'94	'99	'04
B	Amelanchier utahensis	20	14	17	.64	.86	1.28
B	Artemisia nova	41	61	55	2.90	4.92	5.35
B	Artemisia tridentata vaseyana	50	47	50	1.99	4.48	6.42
B	Cercocarpus ledifolius	2	1	2	-	-	-
B	Cercocarpus montanus	16	25	21	1.57	3.73	4.58
B	Chrysothamnus depressus	68	72	76	2.13	3.63	5.44
B	Chrysothamnus viscidiflorus viscidiflorus	59	4	25	.18	.03	.46
B	Gutierrezia sarothrae	118	26	41	1.48	.39	.93
B	Mahonia repens	-	-	-	-	-	-
B	Opuntia spp.	3	5	4	.01	.00	.03
B	Pinus edulis	0	3	1	-	.38	1.03
B	Purshia tridentata	2	2	2	-	.00	-
B	Quercus gambelii	0	0	0	-	-	-
B	Symphoricarpos oreophilus	13	10	16	.84	.82	1.32
B	Tetradymia canescens	0	0	0	-	-	-
Total for Browse		236	209	3763	11.76	19.25	26.88

CANOPY COVER, LINE INTERCEPT --
Management unit 16C, Study no: 17

Species	Percent Cover '04
Amelanchier utahensis	1.73
Artemisia nova	7.36
Artemisia tridentata vaseyana	5.48
Cercocarpus ledifolius	.51
Cercocarpus montanus	3.53
Chrysothamnus depressus	4.03
Chrysothamnus viscidiflorus viscidiflorus	.60
Gutierrezia sarothrae	2.06
Opuntia spp.	.03
Pinus edulis	2.51
Purshia tridentata	.13
Symphoricarpos oreophilus	1.41

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 16C, Study no: 17

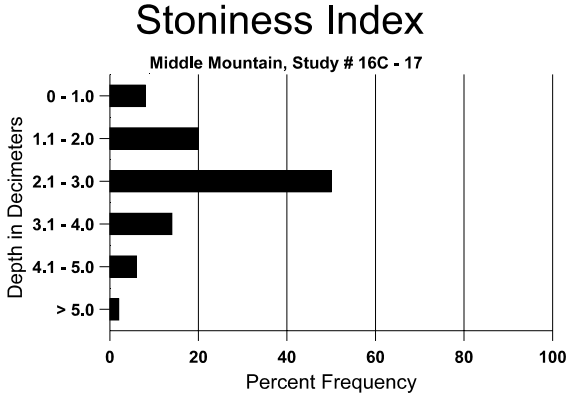
Species	Average leader growth (in) '04
Amelanchier utahensis	3.6
Artemisia nova	1.1
Artemisia tridentata vaseyana	2.4
Cercocarpus montanus	4.2

BASIC COVER --
Management unit 16C, Study no: 17

Cover Type	Average Cover % '88	'94	'99	'04
Vegetation	5.75	29.73	39.15	43.42
Rock	6.50	2.62	2.79	2.26
Pavement	0	.03	.09	.09
Litter	74.25	19.81	27.38	24.07
Cryptogams	0	.60	.55	2.79
Bare Ground	13.50	44.09	38.95	44.63

SOIL ANALYSIS DATA --
Management unit 16C, Study no: 17, Study Name: Middle Mountain

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
15.2	52.0 (16.8)	7.2	44.4	13.8	41.8	1.4	2.0	76.8	0.6



PELLET GROUP DATA --
Management unit 16C, Study no: 17

Type	Quadrat Frequency '94	'99	'04
Sheep	-	2	-

Days use per acre (ha) '99	'04
-	-

Type	Quadrat Frequency		
	'94	'99	'04
Rabbit	9	30	30
Elk	43	21	23
Deer	18	9	20
Cattle	1	-	-

Days use per acre (ha)	
'99	'04
-	-
35 (87)	39 (96)
26 (64)	16 (40)
-	-

BROWSE CHARACTERISTICS --
Management unit 16C, Study no: 17

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier utahensis												
88	**1200**	33	1200	-	-	-	3	67	0	-	11	-/-
94	**440**	-	40	360	40	-	27	32	9	5	5	11/15
99	**620**	-	460	160	-	-	26	6	0	-	0	35/30
04	**380**	-	120	240	20	-	32	26	5	-	0	14/20
Artemisia nova												
88	**599**	-	333	133	133	-	28	6	22	-	6	7/8
94	**1880**	-	540	1060	280	40	11	1	15	5	5	8/19
99	**2480**	120	280	1900	300	180	37	21	12	4	4	11/20
04	**3000**	1820	560	1960	480	260	28	14	16	7	7	8/18
Artemisia tridentata vaseyana												
88	**1933**	633	400	800	733	-	28	45	38	3	7	17/23
94	**2180**	40	100	1360	720	460	28	5	33	13	13	14/25
99	**1540**	40	260	1040	240	300	29	18	16	5	6	19/30
04	**2140**	2140	500	1300	340	320	28	26	16	7	7	14/27
Cercocarpus ledifolius												
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**40**	-	-	40	-	-	50	0	-	-	0	14/18
99	**20**	-	-	20	-	-	0	0	-	-	0	38/32
04	**40**	-	-	40	-	-	0	100	-	-	0	35/34
Cercocarpus montanus												
88	**366**	-	300	66	-	-	9	82	0	-	0	28/37
94	**580**	-	20	500	60	-	21	66	10	10	10	19/37
99	**760**	20	120	640	-	-	50	26	0	-	0	28/36
04	**580**	480	60	520	-	-	3	90	0	-	0	23/32
Chrysothamnus depressus												
88	**3199**	-	1833	1300	66	-	26	18	2	-	1	4/10

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
94	**5240**	-	260	4620	360	40	3	0	7	1	3	3/8
99	**4760**	60	540	4080	140	60	17	6	3	.42	.42	4/11
04	**5980**	280	120	5760	100	20	19	12	2	-	0	4/10
Chrysothamnus nauseosus												
88	**33**	-	-	33	-	-	0	0	-	-	100	20/19
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Chrysothamnus viscidiflorus viscidiflorus												
88	**365**	-	133	166	66	-	18	9	18	-	0	9/12
94	**100**	-	-	80	20	-	0	0	20	20	20	7/8
99	**120**	-	-	120	-	-	0	0	0	-	0	11/17
04	**1360**	60	-	1360	-	-	0	0	0	-	0	9/13
Gutierrezia sarothrae												
88	**899**	-	200	666	33	-	4	0	4	2	4	5/4
94	**3220**	-	200	3020	-	20	0	0	0	-	0	6/7
99	**1500**	120	280	1220	-	-	0	0	0	-	0	6/7
04	**2540**	-	160	2380	-	-	0	0	0	-	0	7/10
Opuntia spp.												
88	**33**	-	-	-	33	-	0	0	100	61	100	-/-
94	**80**	-	40	40	-	-	0	0	0	-	0	2/12
99	**100**	-	40	40	20	-	0	0	20	20	20	2/8
04	**140**	-	20	120	-	-	0	0	0	-	0	3/3
Pinus edulis												
88	**33**	-	33	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**60**	-	20	40	-	-	0	0	-	-	0	-/-
04	**20**	60	-	20	-	-	0	0	-	-	0	-/-
Purshia tridentata												
88	**0**	-	-	-	-	-	0	0	0	-	0	-/-
94	**140**	-	20	80	40	20	71	14	29	14	29	13/30
99	**60**	-	-	60	-	-	0	100	0	-	0	18/76
04	**40**	-	-	20	20	-	50	50	50	-	0	13/47

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Quercus gambelii												
88	**33**	-	33	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Symphoricarpos oreophilus												
88	**699**	66	500	133	66	-	24	57	9	-	0	11/19
94	**440**	-	20	420	-	-	59	0	0	-	0	8/16
99	**240**	-	40	200	-	-	17	0	0	-	0	12/25
04	**520**	-	60	440	20	-	0	0	4	-	0	11/22
Tetradymia canescens												
88	**33**	-	-	33	-	-	100	0	-	-	0	9/10
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-